NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

EVALUATING THE MODERNIZATION OF MILITARY RETIREMENT

December 2015

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE December 2015	3. REPORT TYPE AND DATES COVERED MBA professional report

4. TITLE AND SUBTITLE EVALUATING THE MODERNIZATION OF MILITARY RETIREMENT	5. FUNDING NUMBERS
6. AUTHOR(S) Jonathan B. Leung, Paul C. Notarnicola and Matthew C. Poss	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A	10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number ____N/A____.

12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited	12b. DISTRIBUTION CODE

13. ABSTRACT (maximum 200 words)

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14. SUBJECT TERMS Military Retirement, Net Present Value	15. NUMBER OF PAGES 71
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UU

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89) Prescribed by ANSI Std. 239-18

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EVALUATING THE MODERNIZATION OF MILITARY RETIREMENT

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Submitted in partial fulfillment of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

NAVAL POSTGRADUATE SCHOOL
December 2015

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ABSTRACT

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Active Component
APF	Appropriated Funds
BBA	Bipartisan Budget Agreement
CBO	Congressional Budget Office
CP	Continuation Pay
CSB/Redux	Career Status Bonus/Redux
DB	Defined Benefit
DC	Defined Contribution
FMR	Financial management Regulation
FP	Final Pay
FV	Future Value
FY	Fiscal Year
HI-3	High-3
LES	Leave and Earnings Statement
MILPES	Military Personnel
MCRMC	Military Compensation and Retirement Modernization Commission
MRF	Military Retirement Fund
NAF	Nonappropriated Funds
NPV	Net Present Value
PFM	Personal Financial Management
PV	Present Value
RC	Reserve Component
TSP	Thrift Savings Plan
YOS	Years of Service

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I. INTRODUCTION

A. OVERVIEW

This MBA project evaluates the Military Compensation and Retirement Modernization Commission's Final Report to the President and Congress of the United States, specifically the recommendation toward implementing a modernized retirement system (Military Compensation and Retirement Modernization Commission, 2015). Currently, the retirement system consists of a pure Defined Benefit plan. A member can elect a Thrift Savings Plan contribution but there will not be a government match. The specific recommendations mentioned above result in shifting the current system to a combination of Defined Benefit and Defined Contribution retirement system (Military Compensation and Retirement Modernization Commission, 2015).

B. REPORT ORGANIZATION

This project report is organized as follows:

Chapter II, the literature review, provides a brief history and synopsis of how the military retirement system has evolved since its establishment to familiarize the reader with the relevant vernacular and concepts, while gaining a working knowledge of the existing military retirement structure and various plans. Reviewing and understanding the development of the military retirement system is significant and will provide the necessary background knowledge, foundation and awareness for the reader to better comprehend the proposed benefits and flexibility of the retirement recommendations outlined in the Final Report. The literature review will also address how the analysis within this MBA project is unique and supplements MBA projects from previous periods.

After reviewing the key aspects of the existing military retirement structure, we briefly discuss some of the challenges, issues, and concerns facing the current retirement program. The literature review concludes with a summary of previous published literature, such that the reader has an understanding of the current circumstances to measure the proposed recommendation's merits and shortfalls, along with a firm understanding of the major critiques and judgements against it.

Chapter III, the methodology, discusses the technique, approach and reasoning behind utilizing Net Present Value (NPV) as our financial evaluation tool. NPV accounts for the time value of money and will be shown to be the optimal method of calculating military retirement benefits in today's dollars in order to adequately compare competing retirement options. Chapter III also analyses the fundamental financial concepts that make up NPV, including present value, future value and discount rate. Discount rate, or the desired return on investment, will be thoroughly explored in order to justify investment return assumptions based on managing risk. In the methodology section, we also cover a series of assumptions made on cash flows throughout a military officer's active career and after retirement, initial investments, Thrift Savings Plan investment options and other significant variables that contributed to the results later discussed. The objective of Chapter III is to elaborate on how our methodology will provide a quantitative and qualitative measure of the evaluation of the current military retirement system compared to the proposed recommended changes.

C. MAIN RESULTS

Chapter IV, the results of this study, indicate that even under the most favorable investment and member contribution scenario, the NPV of the current retirement system exceeds that of the new proposal. Under the scenario where an O-5 service member contributes 10 percent of his or her basic pay into TSP's C-fund, thereby receiving the full 5 percent government matching contribution, the NPV of the proposed system still does not match that of the current system. In this scenario, the NPV delta between the two retirement systems is $62,334.24. This scenario assumes a market return of 8 percent (C-Fund). When other, less favorable investment and contribution scenarios are considered, the NPV delta between the two systems grows larger. For instance, under the scenario where an O-5 service member contributes just 1 percent of his or her basic pay into TSP's G-fund, thereby receiving a 1 percent government matching contribution, the NPV delta between the two retirement systems grows to $281,924.29. This scenario assumes a market return of 2 percent (G-Fund).

While Chapter IV of this study indicates that the NPV of the new proposal does not match that of the current system, it also indicates that the new proposal reduces government retirement expenses. Despite the continuation pay bonus and government matching contributions introduced in the new retirement proposal, the overall cost to the government is reduced under every scenario analyzed in this study. Additionally, government savings increase further when service members do not invest at least 5 percent of their basic pay into their TSP accounts, thereby forgoing the full government matching TSP contribution. For example, the results indicate that the total cost savings to the government for scenarios in which an O-5 service member contributes 1 or 3 percent of his or her basic pay into TSP totals $303,197.41 and $273,639.39 per service member, respectively; whereas the total cost savings to the government for scenarios in which an O-5 service member contributes 5 or 10 percent into TSP, thereby earning the full government matching TSP contribution, totals $244,081.38 per service member. All assumptions and parameters are discussed in further detail in Chapter IV.

Chapter V will discuss this MBA project's summary, conclusions and recommendations based on the findings from the Scenario Analysis section. In addition, suggested topics of related study will be provided for possible future research.

D. SCOPE AND LIMITATIONS

This MBA project encompasses a broad analysis and overview of the recent recommendations made by Military Compensation and Retirement Modernization Commission Final Report as an active step towards changing Military Retirement. This analysis, overview and evaluation will be examined by applying the recommendations to a scenario analysis from the perspective of specific military personnel, specified further in the Methodology and Scenario Analysis sections. Due to the scope of this subject, this MBA project is focused on utilizing specific officer scenarios that cover a broad representation of mid-career officers. This project is not meant to evaluate retention or funding mechanisms. Neither does this project encompass the Federal Employee Retirement System or examine in detail the retirement recommendations towards Enlisted

Service members. This MBA project's emphasis will be on evaluating major recommendations to the retirement system, causes and effects, from the perspective of the mid-career military officer.

II. LITERATURE REVIEW

A. INTRODUCTION

This literature review provides an overview of retirement types and a general history of the military retirement system and major changes in recent years since its early establishment in the 1800s, along with major proposals crucial to the development of the current system. The discussion highlights key dates and significant milestones to the military retirement system to better understand the recommendations.

This literature review is not meant to serve as a detailed analysis of each specific development, but the purpose is to serve as a foundation of working knowledge on recent approaches and policy reforms toward the retirement system that are mentioned later on in the Methodology and Scenario Analysis.

B. TYPES OF RETIREMENT PLANS

Retirement systems currently consist of either defined benefit or defined contribution plans. Sometimes, retirement plans can also offer a blended program consisting of the two programs, Defined Benefit (DB) and Defined Contribution (DC).

A defined benefit system or plan has a specific benefit that will be provided to the service member based on various factors, such as years of service (YOS) and base salary. A defined benefit plan normally provides a series of payments, monthly benefits or annuities payments over the lifetime starting at the beginning of the plan or retirement age. The start of the series of monthly payments or benefit is also known as a pension or can also be referred to as an annuity. Sometimes a stream of payments or cash flows can be replaced by a lump sum as well. As of 2015, the current military retirement system utilizes a defined benefit system, providing monthly compensation in the form of annuity payments, where the amount of compensation is based on YOS, basic pay at the start of retirement, and is adjusted annually through a Cost of Living (COLA) index (Kamarck, 2015).

A defined contribution plan is different compared to a DB plan in that a DC has a periodic amount of money that will go into the retirement plan during the present. The amount entering into the retirement plan or pension can be a percentage of the service member's pay or a specified amount, but overall there is a contribution to the investment account. Those contributions and total funds are invested, often into a mutual fund within the retirement plan. At the end of the time horizon, when the member starts drawing from retirement, the funds available depend on how much was saved and contributed to the plan, along with the time periods those funds were invested, and how well of a rate that plan performed in return during the life of the fund (DOD Office of the Actuary, 2015).

There are many pros and cons with a DB and DC plan. It is important to note that a DC plan is dependent on market factors and performance, whereas a DB promises a certain percentage to the retiree based on criteria mentioned above. Currently, the federal government provides a DB retirement system for Active Duty military once retired. Within the Civil Service Retirement System, there is a blended DB and DC plan. Within the private sector, defined benefit plans are being replaced with defined contribution plans due to savings in expenses and obligations (DOD Office of the Actuary, 2015).

C. HISTORY OF RETIREMENT PAY–ACTIVE DUTY

The history of military retirement and pensions traces back to the English Pension law, which served as a harbinger for the American colonial pension legislation (DOD Office of the Actuary, 2015). In Colonial America, the pilgrim settlers of Plymouth Colony established in 1636 that returning soldiers wounded from battle would receive a life pension, provided by the colony. This first form of retirement was designed to incentivize enlistments during military expeditions. These precursors resulted in the pension law of August 26, 1776, which provided soldiers with half pay for life. This program was initially administered as a benefit by each state individually, but was later changed in 1790 when those responsibilities were taken over by the Secretary of War (DOD Office of the Actuary, 2015).

By 1780, Congress had established half-pay pension plans for the remaining life of officers who served to the end of the Revolutionary War (DOD Office of the Actuary,

2015). These pension claims would eventually be paid, but for less than the full established value. In 1818, Congress passed an act only providing the pension to Revolutionary War veterans if the veteran was in need, but because the number of veterans began dwindling and the treasury within the United States grew substantially, consequently full pay was implemented in 1832, regardless of need (DOD Office of the Actuary, 2015). The same process was implemented for pensions for following wars, with each war treated separately. During 1849, management and oversight of pensions under the Bureau of Pensions was transferred to the Department of the Interior, until this responsibility was shifted again to the Veterans Administration (VA) in 1930 (DOD Office of the Actuary, 2015).

The first major nondisability retirement act was created in 1861, resulting in the President of the United States deciding on voluntary retirement of regular officers in all branches of the military with 40 YOS (DOD Office of the Actuary, 2015). Supplemental acts during 1861 and 1862 modified the retirement policy due to age requirements. From the Revolutionary War to the Civil War, pensions have been utilized with some varying aspect of force shaping intention (DOD Office of the Actuary, 2015).

In 1870, Congress enacted the voluntary retirement of officers with 30 YOS upon Presidential approval, and retirement pay became 75 percent of pay of the retired grade. This retirement pay over the 30 YOS, results in a 2.5 percent multiplier per YOS (DOD Office of the Actuary, 2015).

During World War I, significant changes and proposals resulted in limiting the number of officers who were eligible to retire due to stagnant promotion in the Navy. Congress responded in 1916, established and utilized selection boards for promotion to Commander, Captain, and Rear Admiral, based on age-in-grade (DOD Office of the Actuary, 2015). The selection board shifted to service-in-grade in 1926, and officers not selected for promotion retired at 2.5 percent of pay for each YOS, capped at 75 percent of pay. This marked the first time length of service and grade were involved in computing retirement pay (DOD Office of the Actuary, 2015).

In 1938, the Navy saw greater complexity with stagnant promotion due to a large influx of officers from World War I. As a result, Congress limited YOS for Lieutenant Commander to Captain, and changed voluntary retirement from 30 to 20 YOS, upon Presidential approval.

In 1948, military retirements took an even closer step towards its current day structure. The Army and Air Force Vitalization and Retirement Equalization Act of 1948 standardized military retirement compensation for all services as the act authorized "the voluntary retirement of Army and Air Force officers after 20 YOS at least 10 years of which consisted of commissioned service, with retired pay computed by the standard 2.5 percent formula" (Under Secretary of Defense for Personnel and Readiness, 2005). This act placed eligibility of 20 YOS as the minimum threshold for retirement and put all services on equal par. Congress also matched enlisted voluntary retirement using the same formula from the officer plan (Under Secretary of Defense, 2011).

In 1958, the retirement pay was modified to a COLA increase of 6 percent, which would later result in an automatic yearly retirement increase based on increased cost-of-living expenses in 1963. In 1977, this system changed again to include bi-annual COLA increases if the CPI rose by 3 percent for a period of 3 months consecutively (Uniformed Services Salary increase, 1965).

The 2.5 percent multiplier times YOS is known as the Final Pay (FP) nondisability benefit formula related to the Final Pay formula within the Military Retirement System, where personnel who first became members of a uniformed service before September 8, 1980 have their retired pay equal to their final basic pay times a multiplier of 2.5 percent times YOS (DOD Office of the Actuary, 2015).

On September 7, 1980, Congress made another significant change towards the retirement pay formula. If the retiree first became a member of a uniformed service on or after September 8, 1980, the average of the highest 36 months of basic pay is used instead of final basic pay. This method is referred to as the High-3 (HI-3) formula, where the highest 36 months of pay occurs within the highest 3 years of average annual pay. According to the *Valuation of the Military Retirement System*, "this first major change to

retired pay computations since 1948 was endorsed in findings by various committees and commissions" (DOD Office of the Actuary, 2015).

On July 1, 1986, Congress made further changes toward the retirement formula, creating the Redux benefit formula with the Military Retirement Reform Act (MRRA) of 1986. Personnel entering service after July 31, 1986, received 2 percent for each of the first 20 YOS, then 3.5 percent for each of the next 10 YOS, and 2.5 percent thereafter. Upon the service member reaching age 62, the annuity payment was recalculated to equal the annuity payment that would occur if 2.5 percent was used for each YOS. In addition, the COLA adjustment for this group does not keep up with inflation (DOD Office of the Actuary, 2015).

On October 1, 1999, Congress enhanced benefits for military personnel previously under the Redux benefit plan by converting these members to the HI-3 plan. At 15 YOS, these members can elect to (1) remain on the HI-3 plan or (2) elect a Career Status Bonus and convert to the Redux benefit plan. If a member elects the bonus, he or she must continue to remain in service until completing 20 YOS or forfeit a portion of the $30,000 lump sum bonus and shift to the Redux benefit plan as mentioned earlier (Under Secretary of Defense for Personnel and Readiness, 2011).

The three various retirement systems that are current for military personnel in the uniformed services, along with their requisite criteria, are listed in Tables 1 and 2.

Table 1. Summary of the current military retirement systems.

Retirement System	Basis	Multiplier	COLA	Readjustment	Bonus
Final Pay	**Final basic pay**	**2.5% per year up to 75%**	**CPI**	**None**	**None**
High-3	**Average of highest 36 months of basic pay**	**2.5% per year up to 75%**	**CPI**	**None**	**None**
CSB/REDUX	**Average of highest 36 months of basic pay**	**2.0% per year for the first 20 years; 3.5% for each year beyond 20, up to 75%**	**CPI - 1%**	**At age 62, 1) changes multiplier to 2.5% per year up to 75% 2) adjusts COLA to full CPI for past retired years**	**$30,000 at 15th year of service with commitment to complete 20 year career**

Adapted from *Active Duty Retirement, Summary* by Secretary of Defense, 2015, Retrieved from http://militarypay.defense.gov/retirement/ad/18_summary.html

Table 2. Criteria to receive within the current military retirement systems.

Retirement System	Criteria to Receive
Final Pay	**Entry before September 8, 1980**
High-3	**Entry on or after September 8, 1980, but before August 1, 1986 OR Entered on or after August 1, 1986, and did not choose the Career Status Bonus and REDUX retirement system**
CSB/REDUX	**Entered on or after August 1, 1986, AND elected to receive the Career Status Bonus (if you do not elect to receive the Career Status Bonus, you will be under the High-3 retirement system)**

Adapted from *Active Duty Retirement, Summary* by Secretary of Defense, 2015, Retrieved from http://militarypay.defense.gov/retirement/ad/18_summary.html

On October 17, 2006, the John Warner National Defense Authorization Act eliminated the 75 percent multiplier cap for nondisability retirements exceeding 30 YOS

for service members retiring after December 31, 2006. This act allows a service member to achieve a retirement multiplier greater than 100 percent by having 40 YOS and is depicted via Table 3.

Table 3. YOS within the current military retirement systems.

Years of Service

Retirement System	10	15	20	21	22	23	24	25	30	35	40	41
Final Pay	**25%**	**37.5%**	**50%**	**52½%**	**55%**	**57½%**	**60%**	**62½%**	**75%**	**87.5%**	**100%**	**102½%**
High-36	**25%**	**37.5%**	**50%**	**52½%**	**55%**	**57½%**	**60%**	**62½%**	**75%**	**87.5%**	**100%**	**102½%**
REDUX*	**N/A**	**N/A**	**40%**	**43½%**	**47%**	**50½%**	**54%**	**57½%**	**75%**	**87.5%**	**100%**	**102½%**

Adapted from *Active Duty Retirement, YOS* by Secretary of Defense, 2015, Retrieved from http://militarypay.defense.gov/retirement/ad/18_summary.html

On March 14, 2005, Secretary of Defense Donald Rumsfeld chartered a proposal that led to the Defense Advisory Committee on Military Compensation (DACMC). This proposal was established to "identify approaches to balance military pay and benefits in sustaining recruitment and retention of high-quality people, as well as cost-effective and ready military force" (Henning, 2011, p. 10). A chapter of the committee's reviews and recommendations focused on retirement reform and discussed examples of a modernized, reformed and blended retirement system.

The DACMC noted three significant criticisms of the current military retirement system: 1) deferred compensation; 2) lack of flexibility for proper force management; and 3) equity for service members who do not satisfy 20 YOS (Henning, 2011, p. ii). In addition, the committee noted the context for service members is different today than when the retirement system was first conceived. The latest retirement system does not take into consideration longer life expectancy, transferability of military skills, under value of retention incentives over high expenditures of a retirement plan. Other highlights of their proposal consisted of service members shifting their retirement plan from a DB to

a blended plan of DB and DC, where military personnel are vested after 10 YOS. Options would be afforded to personnel to receive their pension sooner by accepting a percentage reduction each year if they were below a set age. In a DC plan, the government would match contributions based on time in grade and YOS of that individual member. Service members with greater YOS would receive higher matching on a yearly basis (Henning, 2011).

In May 2010, a Defense Business Board (DBB) was established within the DOD organization and reported directly to the Secretary of Defense, Robert Gates (Henning, 2011, p. 15). Gates directed the board to identify alternatives to reduce the DOD's overhead and defense budget by $100 billion over a 10 year period. Later on July 21, 2011, a briefing by the DBB was released proposing to eliminate the defined benefit retirement system completely and replaced with a defined contribution plan, with the Thrift Savings Plan (TSP) being the most suitable engine to act as the defined contribution cog, where the government would match a contribution, which would vary depending on various circumstances (YOS, hardship of duty, military skill sets, etc.). Also, the plan would be transportable and interchangeable between the government and private sector (Henning, 2011).

Another key feature would be earlier vesting. As Herring (2011) observed, he DBB proposal would allow vesting significantly early on within 3 to 5 years compared to the current 20 year time requirement, but at reduced rates. Also, the plan would be payable at a later age, 60 to 65 to better match that of Social Security. Also, the policy would be transferrable to a family member upon death, survivorship and allowances under various circumstances, similar to a private sector 401(k) plan. Current service members would not be impacted and would be grandfathered into prior policies (Henning, 2011).

On December 10, 2013, the Bipartisan Budget Act of 2013 resulted in the most updated changes towards the current retirement system regarding COLA calculation over the payment period (DOD Office of the Actuary, 2015). For a service member under the age of 62, the COLA increase is equivalent to CPI minus 1 percent, matching the CSB/Redux benefit plan. Essentially, the BBA 2013 reduces the COLA adjustment to

retired and survivor pay of members, beginning December 1, 2015, who have not reached age 62 to full COLA less 1 percent. Once the member reaches age 62, retired pay is recomputed to restore the reductions made to their COLA. On February 15, 2014, the President signed Senate Bill 25, which grandfathers all military members and retirees who entered service prior to January 1, 2014, from the reduced COLA formula (Henning, 2011).

D. SUMMARY AND THE CURRENT RECOMMENDATION OF RETIREMENT PAY–ACTIVE DUTY

The Military Retirement System of today has grown from a fledgling pension program to a plan utilized to assist in force shape management while providing a means to attract quality personnel into military service and reward career service members with a competitive compensation package for retirement that allows security. The challenge is to adapt and ensure the Military Retirement System is fiscally sustainable.

On January 29, 2015, the Military Compensation and Retirement Modernization Commission (MCRMC) issued its Final Report to the President and Congress of the United States (Military Compensation and Retirement Modernization Commission, 2015). Below is a summary of the Final Report:

Modernized Retirement System

Transition towards a Defined Contribution plan

Smaller, deferred payouts

401(k)-style savings plans

Lump Sum amounts / Continuation Pay at 12 YOS

Retirement benefits to Force that leaves prior to 20 YOS

TSP matching

The purpose of this MBA project still remains to evaluate the proposed recommendations listed above compared to the current Military Retirement System (Final Report, 2015). Understanding the background and history of the military retirement

system provides a context to assess the current system's Net Present Value scenario and offers service members a side by side comparison. Next in Chapter III Methodology, this MBA project will examine the basis for the NPV system, description and assumptions, inputs and outputs toward the calculation of NPV.

III. METHODOLOGY

A. INTRODUCTION

This chapter introduces the case-study methodology on which the findings of the main study are based and to determine our calculations of Net Present Value (NPV) when comparing the present DB military retirement system to the proposed blended system. We will explain how our data was selected and why NPV was chosen as the benchmark to evaluate that data. The concepts of present value, future value and discount rate will be described in detail in order to better understand NPV. The investment options used in our model to calculate discount rates will be thoroughly reviewed. Finally, the cash flow timelines for both the present and proposed military retirement systems will be presented and all assumptions used in our model will be clarified.

B. NET PRESENT VALUE

NPV is based on the premise that a dollar today is worth more than a dollar in the future. This is known as the time value of money. The discrepancy arises because of the expected future rate of return on an investment using that dollar. For example, an investment of $100 today would be worth $105 in one year if assuming a 5 percent annual rate of return. Because the present value of $105 is $100, the NPV is $0 ($100–$100). An investment with an NPV of zero means that investment pays back the original contribution plus the desired rate of return. A positive NPV would return more than 5 percent, while a negative NPV would return less. NPV can seem counter-intuitive at first because if the return was 3 percent instead of 5 percent, NPV would be negative even though the investor would have gained capital. However, an investment that returned 3 percent failed to meet the required 5 percent rate of return and is therefore inferior to what was expected.

The modern theory of net present value has its beginnings in the late 1800s and the construction of railways in the United States. Because railroads were extremely expensive to build and profit would not be realized immediately, investors needed a method to determine the likely return on investment many years into the future (Jones &

Smith, 1982). Railroad companies had many possible new railway locations to pick from. Which would be the most profitable location long-term? In addition, wealthy investors could put their money to work outside the railroad industry. If another investment would be more lucrative, a railway may not be built at all. NPV was the tool to resolve the dilemma.

Mathematicians and Economists began studying net present value in earnest in 1907, the year Irving Fisher published *The Rate of Interest* (Jones & Smith, 1982). In the book, Fisher laid out four specific principles to guide investment decisions. These principles revolve around discounting the present value of one's money against its future value using the market rate of interest. Because an investor has many possible options to choose from when deciding where to invest his money, Fisher's model offered a way to determine the comparative advantage of each possibility stated in present dollar value. The option that offered the greatest return in present dollars after accounting for the market rate of interest over the payback period of the investment should be the one chosen by the rational investor (Fisher, 1930).

Beginning in the 1950s, NPV theory became entrenched in finance textbooks and started to be widely used by corporations to guide their capital expenditure evaluations (Jones & Smith, 1982). Today, NPV is the most commonly used and most trustworthy method available to those facing investment decisions. For this reason, we will utilize NPV to compare military retirement options and conclude which offers the best financial return for Officers spending twenty years in the service. We will calculate return for Officers just entering the military who need to decide whether or not to remain grandfathered under the old retirement system or join the new.

Other approaches to capital budgeting exist, but these methods fall short of having the final authority of NPV, which is always produces the optimal decision (A. Menichini, personal communication, October 14, 2014). The two most popular methods are the payback period approach and internal rate of return (IRR). The payback period approach simply determines the time required for the original investment to be recovered. The investor decides upon the maximum amount of time he is willing to wait in order to break even. If the payback period is less than that amount of time, he will go forward with the

investment. This method is inferior to NPV for two reasons (A. Menichini, personal communication, October 14, 2014). First, it does not consider the time value of money. The dollars returned 5 years in the future will be worth less than the dollars invested today. Second, the payback period method does not take into account the cash flows after the payback has been attained. This results in sub-optimal financial analysis because investment returns following the payback period may be steady, very high or non-existent. Payback period analysis ignores these returns, while NPV does not.

IRR is superior to payback period but still has its flaws when compared to NPV. IRR exists to calculate the rate of return on an investment and does not place a pre-determined return requirement on the initial outlay. However, there are pitfalls to IRR (A. Menichini, personal communication, October 14, 2014). To generate an optimal IRR solution, normal cash flows are assumed. That is, there are no negative cash flows except for the original investment outflow. Some financial flows, such as those experienced by insurance companies, behave quite differently because inflows precede outflows. If a project has non-normal cash flows there can be multiple IRRs, leading to a confusing and sub-optimal solution. Additionally, IRR does not take into account the dollar scale of the investment. An investment of $1000 may have the same IRR as an investment of $1,000,000. NPV uses absolute dollar values and avoids this problem.

C. PRESENT VALUE

Present value can be defined just as it sounds - as the present value of a sum of money with assigned future value. See Figure 1 for the present value (PV) formula. The PV formula is being utilized to properly capture the time value of money concept in our analysis and will allow us to properly quantify the value of each available retirement system income stream and allow us to examine the tradeoff between the two. Variables that make up the PV formula are identified as followed:

C_t = cash payment
r = rate of return
t = number of periods.

In this analysis, C_t represents monetary payments received under each retirement system being considered. Rate of return (r) is the rate being used to adjust for the time value of money. Finally, (t) is the representative time factor and is indicative of a time period that extends into the future. The underlining principle in this analysis is that various cash flows that take place at different periods, indicative of the retirement options being analyzed, cannot be aggregated and analyzed until they are all discounted back to the same point in time.

Figure 1. Present value formula

$$PV = \frac{C_t}{(1+r)^t}$$

D. FUTURE VALUE

Future value (FV) can be described as the monetary value of any given asset at a time period in the future. See Figure 2 for the future value formula. The FV formula can be derived algebraically from the PV formula. Given both a present value set of cash payments and r value, we can compute an expected cash flow value for any period in the future. Our analysis utilizes FV calculations to project cash value figures into future time periods for the retirement system options being analyzed. Since the FV formula is derived from the PV formula, variable descriptions remain unchanged from above.

Figure 2. Future value formula

$$FV = C_t (1+r)^t$$

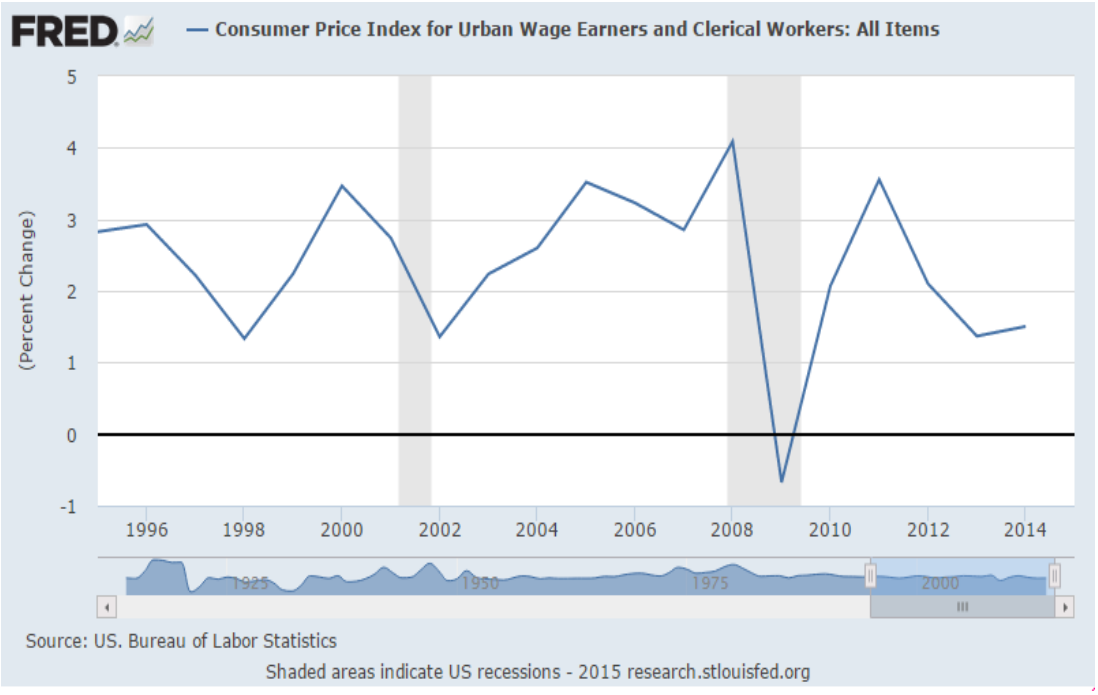
E. DISCOUNT RATE

Perhaps the most important assumption made when calculating the NPV of an investment is determining the discount rate that will be used. Assigning a reliable discount rate to our NPV formula is crucial because of compounded returns over an extended time period. A change of even a few percentage points will dramatically alter the final valuation.

The discount rate is the desired rate of return on an investment or the expected return on an investment of similar risk. For example, if a 10 percent annual discount rate is assumed, $110 one year from now would have a present value of $100. A higher discount rate indicates a riskier investment and requires a smaller initial investment to reach a desired future valuation. Because the proposed military retirement package offers a very different risk profile from the current plan, a reliable discount rate is critical to determining which option should be preferred.

The present military retirement system is a defined-benefit program based on a percentage of average base pay during a service member's final three years of active duty. The payment is adjusted each year with a cost of living allowance (COLA) linked to changes in the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W), as determined by the Department of Labor (Smith, 2014). It is important to note that our model assumes a discount rate of 2 percent for defined-benefit payments not because of COLA, but because these payments are similar to a government bond the service member has earned. This bond is assumed to have a 2 percent discount rate and can compared to historical COLA rates in order to apply a test of reasonableness. This discount rate is reasonable when compared to the average CPI-W increase of approximately 2 percent over the past twenty years, as seen in Figure 3.

Figure 3. CPI-W annual percentage change from 1995–2015



Adapted from *Consumer Price Index for Urban Wage Earners and Clerical Workers: All Items* [CWUR0000SA0], 2015, Retrieved from FRED, Federal Reserve Bank of St. Louis https://research.stlouisfed.org/fred2/series/CWUR0000SA0/.

Note that a small discount rate is used because the risk is also small. The service member faces minimal risk because his retirement pay will increase or decrease slightly each year to keep up with inflation or deflation in the broader economy. Importantly, the government bears 100 percent of the responsibility for meeting these cost changes each and every year until the service member's death.

Unlike the current model, the Commission's proposed plan incorporates a defined-contribution aspect to military retirement pay. Much of a service member's retirement will be dependent on investment returns from stocks, bonds and United States Treasuries. Because the discount rate is an expression of risk, a higher discount rate will be needed for the proposed model to produce greater returns to the service member (and greater savings to the government) than the current defined-benefit plan. Our models assume different discount rates for different investment options that are available to service members. We will now explore those investment options in further detail.

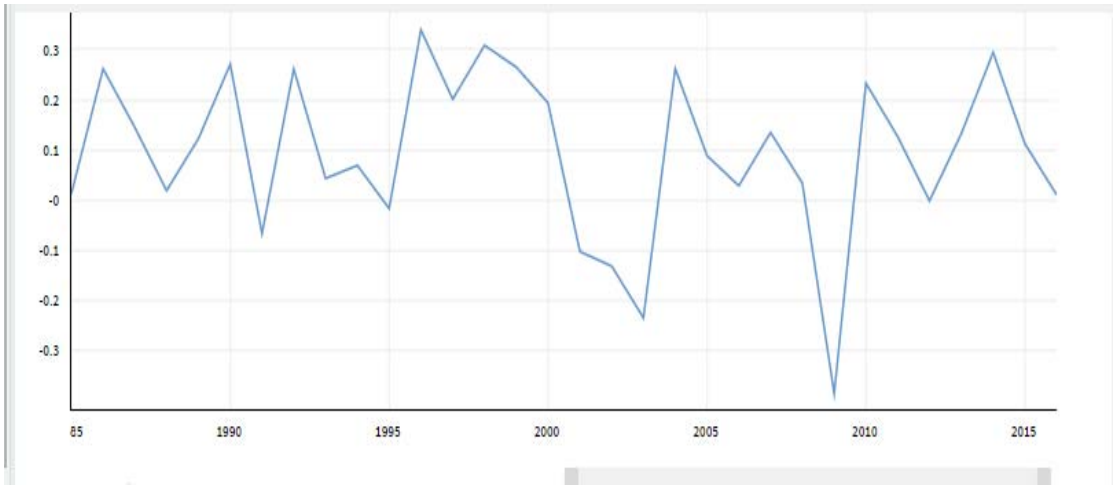
F. THRIFT SAVINGS PLAN (TSP)

The TSP is designed to give Federal workers a 401K-type savings vehicle. Participation in the program is also available to uniformed military personnel. The current defined-benefit retirement plan allows service members to contribute a percentage of pay to the TSP but provides no matching contributions. The proposed retirement changes do provide a matching contribution by the government of up to 5 percent of base pay (Military Compensation and Retirement Modernization Commission, 2015). Under the defined-contribution retirement proposal, it is imperative for all service members to fully understand their TSP investing options because the monetary value of their retirement will be profoundly affected by market returns.

The TSP offers ten managed funds in which participants may choose to invest. Our models will compare three TSP investment options, the G Fund, the C Fund and the L 2050 Fund. The G Fund is the most conservative fund available. It invests in a short-term United States Treasury security that has been issued to the TSP. G Fund gains come completely from the interest income of that short-term Treasury security (Thrift Savings Plan, 2015). Because the United States Government guarantees the payments of the G Fund, it is not subject to default. The only risk to the investment is the possibility that inflation outpaces the Fund's return. The 3-year return of the G Fund is 1.89 percent and the 5-year return is 2.18 percent (Thrift Savings Plan, 2015). The G Fund discount rate our models assume is 2 percent.

The C Fund is another popular TSP investment option. Its goal is to match the return of the S&P 500 Index, which is an index made up of 500 large American companies listed on the New York Stock Exchange and the NASDAQ (Thrift Savings Plan, 2015). This C Fund discount rate is much larger than the G Fund discount rate because the S&P 500 is a much riskier investment. The Index's average annual return over the last 30 years is seen in Figure 4, which is approximately 8 percent. However, annual increases or decreases can be very large. During some years the service member's TSP account will dramatically decrease in value while in many others it will significantly rise. The C Fund discount rate our models assume is 8 percent.

Figure 4. S&P 500 annual rate of return from 1985–2015



Adapted from *S&P 500 Index*, 2015, Retrieved from https://www.quandl.com/data/YAHOO/INDEX_GSPC-S-P-500-Index

The last TSP Fund we will incorporate in our models is the L 2050 Fund. It is one of five life cycle funds offered by the TSP. It consists of a mix of other TSP funds, such as the C and G Funds, as well as funds focused on bonds, international stock markets and small cap stocks (Thrift Savings Plan, 2015). Initially, the L 2050 Fund is heavily weighted in riskier investments but shifts the allocation mix to make it more conservative as the year 2050 approaches. At that time investors would begin to withdraw their money and have a lower risk tolerance. The discount rate our models assume for the L 2050 Fund is 6 percent. The Fund has been in existence since 2011, making useful historical return statistics impossible to obtain. By comparison, the L 2030 Fund has much more historical data. Its return since inception is almost exactly 6 percent (Thrift Savings Plan, 2015), so we can assume our model's 6 percent discount rate for the L 2050 Fund is reasonable.

Over a multi-decade investment period, which is assumed, the proposed TSP defined-contribution retirement return can be significantly greater than the present defined-benefit return using the CPI-W Index if the discount rate is high enough. Importantly for the government, once the service member retires from the military, the defined-contribution portion of their pay does not come from tax dollars, but instead from

stock market returns. Our research model seeks to quantify how the proposed retirement changes have the potential to financially benefit both the government and the service member.

G. CASH FLOW TIMELINES

The cash flow timeline for the proposed defined-contribution military retirement system differs from the current defined-benefit timeline because it includes TSP matching, continuation pay at the twelfth year of service, and a retirement pay multiplier of 2 instead of 2.5. Figure 5 shows the traditional system, from age 22 to age 85.

Figure 5. Present military retirement system cash flows

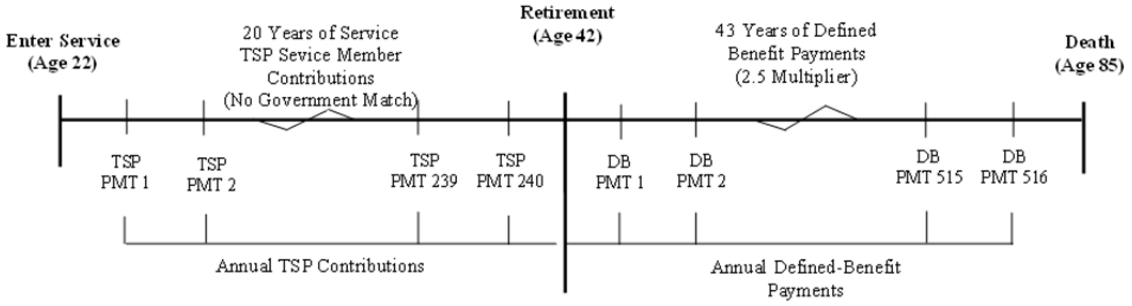
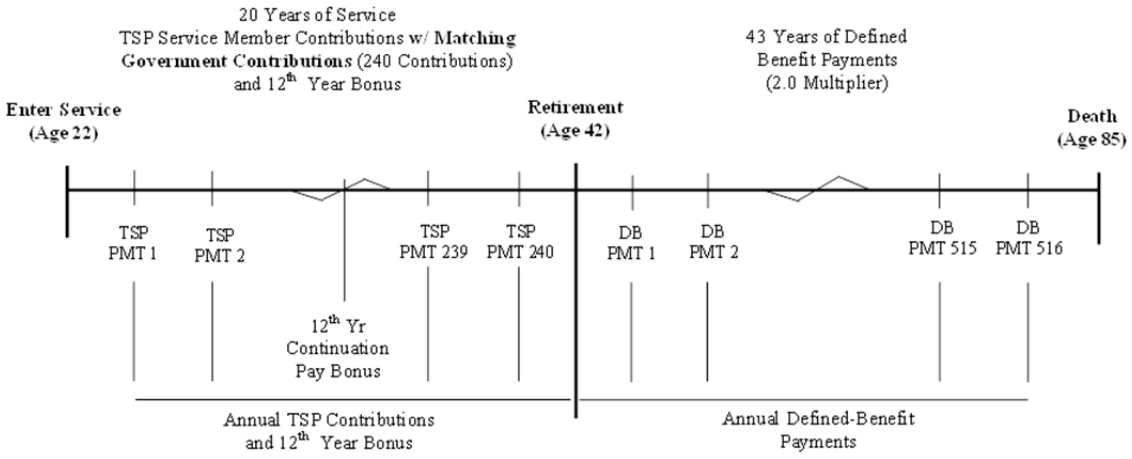


Figure 6. Proposed military retirement system cash flows



We assume service members will contribute the same percentage of base pay to their TSP in both systems. The difference is the proposed system offers a government match. Chapter IV will explore the specifics of calculating the NPV of all payments for both retirement plans.

H. ADDITIONAL ASSUMPTIONS

Several assumptions not previously stated are made in the course of our analysis. This section will provide the details of those assumptions.

1. Officer Pay Tables

Officer basic pay tables are shown in Figure 7 and assumed to remain unchanged in the future, with the exception of annual percentage pay increases across all ranks and years of service.

Figure 7. Military officer basic pay chart

BASIC PAY—EFFECTIVE JANUARY 1, 2015											
Pay Grade	2 or less	Over 2	Over 3	Over 4	Over 6	Over 8	Over 10	Over 12	Over 14	Over 16	Over 18
O-10[f]											
O-9[f]											
O-8[f]	9,946.20	10,272.00	10,488.30	10,548.60	10,818.60	11,269.20	11,373.90	11,802.00	11,924.70	12,293.40	12,827.10
O-7[f]	8,264.40	8,648.40	8,826.00	8,967.30	9,222.90	9,475.80	9,767.70	10,059.00	10,351.20	11,269.20	12,043.80
O-6[f]	6,186.60	6,796.80	7,242.90	7,242.90	7,270.50	7,582.20	7,623.30	7,623.30	8,056.50	8,822.40	9,272.10
O-5	5,157.60	5,810.10	6,212.10	6,288.00	6,539.10	6,689.10	7,019.10	7,261.50	7,574.70	8,053.80	8,281.20
O-4	4,449.90	5,151.30	5,495.10	5,571.60	5,890.50	6,232.80	6,659.10	6,990.60	7,221.00	7,353.60	7,430.10
O-3	3,912.60	4,435.20	4,787.10	5,219.40	5,469.60	5,744.10	5,921.10	6,213.00	6,365.40	6,365.40	6,365.40
O-2	3,380.70	3,850.20	4,434.30	4,584.00	4,678.50	4,678.50	4,678.50	4,678.50	4,678.50	4,678.50	4,678.50
O-1	2,934.30	3,054.30	3,692.10	3,692.10	3,692.10	3,692.10	3,692.10	3,692.10	3,692.10	3,692.10	3,692.10

Adapted from *Basic Pay – Effective January 1, 2015*, Retrieved from http://www.dfas.mil/militarymembers/payentitlements/military-pay-charts.html

Annual Pay Increase

Our model assumes a 1 percent pay increase per year as part of the annual National Defense Authorization Act. The pay raises become effective January 1 of each year.

Age at Service Entry

Our models assume Officers enter service and are commissioned at 22 years of age.

Life Expectancy

The Military Compensation and Retirement Modernization Commission's Final Report assumes a life expectancy of 85 years for military retirees. We use the same life expectancy in our analysis. Life expectancy for all Officers must be assumed to calculate total defined-benefit payments after retirement from the military.

Promotion Gates

Promotion assumptions must be made because of the changes to base pay that occur with each higher rank. TSP contributions are calculated as a percentage of base pay. The standard promotion path assumptions (Defense Officer Personnel Management Act of 1980, 1980) are:

O2 – 2 years from date of Commission

O3 – 4 years from date of Commission

O4 – 11 years from date of Commission

O5 – 17 years from date of Commission

It is important to note that most Officers at pay grades of O4 and above are not immediately promoted or paid at the next pay grade until approximately one year after they are selected for promotion by a promotion board. For example, though an Officer is

selected for O4 ten years after Commission, we assume they will promote to O4 and begin earning O4 pay 11 years after Commission.

Bonuses and Special Pay

Our research does not assume retention bonuses or specialized pay that may be received in certain Officer communities, such as aviation, submarine or special operations.

High-3 Retirement System

Officers who entered military service after September 7, 1980 are subject to having their retirement pay calculated using the average of their base pay over the final three years of their service (Defense Finance and Accounting Service, 2015). The high-3 retirement system will be assumed for all service members in our analysis.

Retirement Pay Multipliers

The present defined-benefit military retirement system utilizes a retirement pay multiplier of 2.5. This means each year of service is multiplied by 2.5 to obtain a percentage of high-3 base pay the service member receives upon retirement. For example, a service member who retires after 20 years of service would receive 50 percent of his or her high-3 base pay each year in retirement, plus COLA. Under the proposed defined-contribution retirement system, we assume a multiplier of 2. This is based on the recommendation from the Military Compensation and Retirement Modernization Commission's Final Report. Using a multiplier of 2, a service member retiring at 20 years of service would receive 40 percent of high-3 base pay each year in retirement, plus COLA.

Continuation Pay

An important feature of the proposed defined-contribution retirement system is a continuation pay lump-sum bonus paid to each Officer after 12 years of service. The Military Compensation and Retirement Modernization Commission's Final Report recommends this continuation bonus be based upon a multiplier of monthly base pay

(Military Compensation and Retirement Modernization Commission, 2015). For an active-duty Navy Officer the multiplier is 15.2. Our project assumes this number. It is also assumed that 100 percent of the 12-year continuation pay will be deposited in the service member's TSP.

In Chapter IV of our project, we will compare the NPV of the present military retirement system to the proposed system. Present value, future value and multiple discount rates will be used to determine the monetary value of retirement options available to service members. Additionally, the cost to the Government of each retirement system will be analyzed.

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IV. ANALYSIS OF RESULTS

A. INTRODUCTION

This chapter discusses the results obtained from conducting a NPV analysis comparing the current HI-3 defined benefit retirement system against the newly proposed system that now includes the government matching defined contribution component. All methodologies utilized to derive at the results were discussed in Chapter III. The NPV analysis was conducted to arrive at final retirement NPV totals for both the current and proposed retirement systems and to determine the total costs to the government under both systems. In doing so, multiple scenarios were examined to capture realistic and wide ranging TSP member contribution rates and, when applicable, the corresponding government matching contributions. Similarly, the multiple scenarios examined incorporate the various TSP funds discussed in Chapter III and utilize their various historical rates of return to arrive at final NPV results for both the current retirement system and the newly proposed system. The NPV model, which is provided as an electronic amendment to this MBA project, was created utilizing Microsoft Excel to incorporate actual base pay rates, typical promotion paths, time-in-grade pay raises, annual pay raises, and COLA adjustments into this analysis. Finally, to remain consistent with the assumptions made by the Military Compensation and Retirement Modernization Commission, the following assumptions are made: military officers enter military service at age 22, retire from military service at age 42, and death occurs at age 85. In order to arrive at a NPV for both retirement systems, all future monthly defined benefit payments under both systems are discounted back to the retirement eligibility age of 42, while the future value of all monthly TSP contributions, matching or otherwise, for the defined contribution portions of both systems are determined and brought forward to the retirement eligibility age of 42.

B. NPV OF CURRENT HI-3 RETIREMENT SYSTEM

1. PV of Defined Benefit

As discussed in Chapter II, the HI-3 system is the current retirement system in place for military service members. The system offers defined benefit payments to service members after the completion of 20 years of service (YOS). Since the assumption is that the typical active duty officer enters service at age 22, retirement is reached at age 42 after completion of 20 YOS. At retirement eligibility, the defined benefit payment earned by the officer is calculated utilizing a 2.5 percent multiple of his or her HI-3 base pay multiplied by the total number of service years completed (Military Compensation and Retirement Modernization Commission Report, 2015). A typical officer, given typical promotion and time-in-grade requirements, should reach the O-5 pay rate by 20 YOS with an average HI-3 base pay of $8,342.45. As such, an O-5 entering retirement at age 42 would be paid the following monthly defined benefit:

$8,342.45(HI-3 Avg) x .025(HI-3 Multiplier) x 20 (YOS) = $4,171.23.

Assuming retirement is entered into at age 42 and death occurs at age 85, the service member would receive monthly defined benefit payments for 43 years. That is, the service member would receive 516 total defined benefit payments (12 pmt/yr * 43years) from the start date of his or her retirement until death at age 85. COLA was incorporated into our analysis to account for the annual pay raises that retirees receive during retirement. Based on historical averages, a 2 percent COLA was added to the monthly defined benefit payments that were determined. The COLA adjustments to the monthly defined benefit payments were added at the beginning of each year of retirement and remained fixed for the duration of that particular year.

The present value (PV) formula was utilized to individually discount each one of the 516 total defined benefit payments received over the 43 year retirement period. A rate of return (r) of 2 percent was used as an offset to the 2 percent COLA adjustment that

was incorporated. Table 4 provides a summary of the PV calculations for the defined benefit portion of the current retirement system.

Figure 8. Timeline (current system)

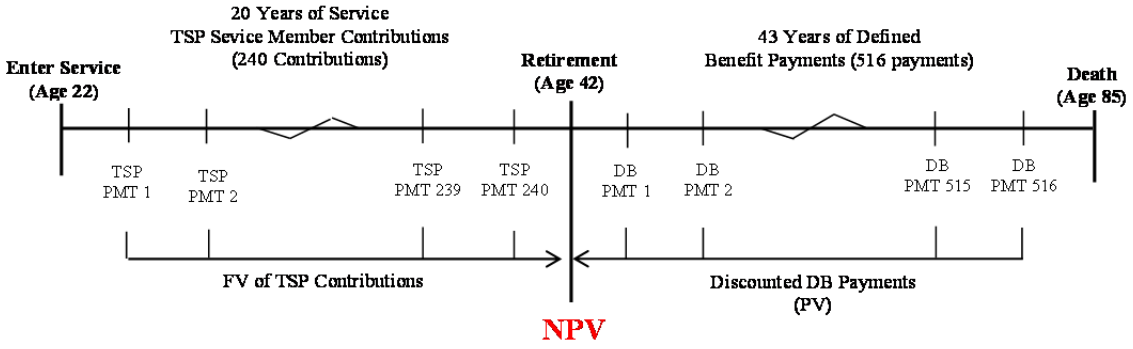

Table 4. Present value of defined benefit (current system)

PMT Period (20 Total YOS)	PMT	PV	
1	$ 4,171.23	$ 4,164.29	
2	$ 4,171.23	$ 4,157.36	
3	$ 4,171.23	$ 4,150.44	
4	$ 4,171.23	$ 4,143.54	
5	$ 4,171.23	$ 4,136.64	
6	$ 4,171.23	$ 4,129.76	
7	$ 4,171.23	$ 4,122.89	
8	$ 4,171.23	$ 4,116.03	
9	$ 4,171.23	$ 4,109.18	
10	$ 4,171.23	$ 4,102.34	
11	$ 4,171.23	$ 4,095.52	
12	$ 4,171.23	$ 4,088.70	End Year 1
13	$ 4,254.65	$ 4,163.54	
14	$ 4,254.65	$ 4,156.61	
15	$ 4,254.65	$ 4,149.69	
16	$ 4,254.65	$ 4,142.79	
17	$ 4,254.65	$ 4,135.90	
18	$ 4,254.65	$ 4,129.01	
19	$ 4,254.65	$ 4,122.14	
20	$ 4,254.65	$ 4,115.28	
21	$ 4,254.65	$ 4,108.44	
22	$ 4,254.65	$ 4,101.60	
23	$ 4,254.65	$ 4,094.78	
24	$ 4,254.65	$ 4,087.96	End Year 2
⋮	⋮	⋮	
505	$ 9,582.34	$ 4,132.80	
506	$ 9,582.34	$ 4,125.92	
507	$ 9,582.34	$ 4,119.06	
508	$ 9,582.34	$ 4,112.21	
509	$ 9,582.34	$ 4,105.36	
510	$ 9,582.34	$ 4,098.53	
511	$ 9,582.34	$ 4,091.71	
512	$ 9,582.34	$ 4,084.90	
513	$ 9,582.34	$ 4,078.11	
514	$ 9,582.34	$ 4,071.32	
515	$ 9,582.34	$ 4,064.55	
516	$ 9,582.34	$ 4,057.78	End Year 43
TOTALS	$ 3,361,651.04	$ 2,121,157.54	

The results indicate that while a total of $3,361,651.04 in defined benefit is paid to the service member over the course of the 43 year retirement period, the total PV of all monthly retirement payments discounted back to the start of retirement (age 42) is $2,121,157.54. The right-hand side of Figure 1 graphically illustrates retirement defined benefit payments being discounted to the start of retirement at age 42. That is, the right-hand side of the outline depicts the discounting of 516 defined benefit payments to arrive at the $2,121,157.54 PV total for the defined benefit component of the current retirement system. In Chapter IV subsection B. 3, this total will be combined with a FV analysis of career-long member TSP contributions discussed in the proceeding section in order to arrive at a total NPV for the current HI-3 retirement system.

2. FV of TSP Member Contributions (No Government Match)

As Chapter II indicates, the current HI-3 retirement system is a defined benefit system only. That is, the government does not match any service member TSP contributions. However, as described in Chapter IV subsection C. 2 of this project, deriving at a NPV for the new retirement system proposal involved finding the FV of both member and government matching TSP contributions over the course of a 20 year career. As such, in an effort to ensure an accurate comparison of the NPV for both retirement systems, the PV of member TSP contributions was determined for the current system as well, albeit with no government matching contributions.

In conducting the analysis, various assumptions were made with regard to not only how much base pay service members would contribute to TSP, but also to which TSP fund they would invest into. It is important to note that the same base pay contribution rates and the same TSP investment funds were applied in this analysis to arrive at NPV figures for both the current and new retirement system proposal. Recognizing the fact that not all service members will contribute the same percentage of base pay into TSP, multiple member contribution rates were factored into the analysis in an attempt to capture realistic scenarios. As such, TSP contribution rates were factored in at a rate of 1 percent, 3 percent, 5 percent, and 10 percent of service member base pay. Service member base pay totals were taken directly from the 2015 military basic pay

table and applied to the typical promotion path for officers in line with TIG requirements. For example, the assumption was made that officers enter military service and are paid at the O-1 rate for two years before being promoted to the O-2 rate. The officer would then be paid at the O-2 rate for another two years before being promoted to the O-3 rate. Similarly, and in accordance with typical mandated TIG requirements, assumptions were made that the typical officer is paid at the O-3 rate for 6 years, at the O-4 rate for 6 years, and at the O-5 rate for 3 years at which point the officer reaches retirement eligibility with 20 YOS completed. In addition to pay raises based on promotions, annual pay raises were factored into the analysis at 1 percent. The 1 percent rate was chosen because it is consistent with of the annual pay raise that the military has received over most recent years.

As discussed in Chapter III, when investing into TSP, service members have a wide range of choices with regards to which TSP funds they can invest into. This analysis incorporates the historical rates of return for TSP's G-Fund, L2050 Fund, and C-Fund. These funds have returned 2 percent, 6 percent, and 8 percent, respectively, from inception.

The future value (FV) formula was utilized to derive at a future value for each one of the 240 (1 TSP contribution per month for 20 years) total TSP contributions made by the service member over the course of a 20 career. Referring to Figure 1 again, these contributions are graphically depicted on the left-hand side of the timeline with total FV for each member contribution being brought forward to the start of retirement at age 42. Future value totals were calculated under multiple scenarios in which the service member could contribute 1 percent, 3 percent, 5 percent, or 10 percent of base pay into the G-Fund, L2050 fund, or the C-Fund. The FV totals of service member TSP contributions under these scenarios are presented in Table 5.

Table 5. Future value of TSP contribution (current system)

	20 Year Future Values:		
Member TSP Contribution (% of base pay)	G Fund (r = 2%)	L 2050 (r = 6%)	C Fund (r = 8%)
1%	$ 17,631.97	$ 26,011.46	$ 32,162.45
3%	$ 52,895.91	$ 78,034.37	$ 96,487.35
5%	$ 88,159.84	$ 130,057.28	$ 160,812.24
10%	$ 176,319.69	$ 260,114.57	$ 321,624.49

3. Total NPV of Current HI-3 Retirement System (Defined Benefit + Member TSP Contributions)

To arrive at the total NPV of the current HI-3 retirement system, our analysis combines the outcomes of both the right and left sides of the Figure 1 NPV outline. That is, the total PV of defined benefit payments received in retirement and the total FV of service members' career-long TSP contributions were calculated and added together to arrive at NPV totals for each of the scenarios analyzed. The totals are indicative of what the total value of the retirement plan would be to the service member at the start of his or her retirement at age 42. Table 6 provides NPV totals for each of the scenarios analyzed.

Table 6. Total NPV (current system)

TSP Investment Scenario	(A) FV of TSP Contributions	(B) PV of Defined Benefit	(A) + (B) TOTAL NPV
20 YOS, 1% Member Contribution, G Fund	$ 17,631.97	$ 2,121,157.54	$ 2,138,789.51
20 YOS, 1% Member Contribution, L2050	$ 26,011.46	$ 2,121,157.54	$ 2,147,169.00
20 YOS, 1% Member Contribution, C Fund	$ 32,162.45	$ 2,121,157.54	$ 2,153,319.99
20 YOS, 3% Member Contribution, G Fund	$ 52,895.91	$ 2,121,157.54	$ 2,174,053.45
20 YOS, 3% Member Contribution, L2050	$ 78,034.37	$ 2,121,157.54	$ 2,199,191.91
20 YOS, 3% Member Contribution, C Fund	$ 96,487.35	$ 2,121,157.54	$ 2,217,644.89
20 YOS, 5% Member Contribution, G Fund	$ 88,159.84	$ 2,121,157.54	$ 2,209,317.39
20 YOS, 5% Member Contribution, L2050	$ 130,057.28	$ 2,121,157.54	$ 2,251,214.83
20 YOS, 5% Member Contribution, C Fund	$ 160,812.24	$ 2,121,157.54	$ 2,281,969.79
20 YOS, 10% Member Contribution, G Fund	$ 176,319.69	$ 2,121,157.54	$ 2,297,477.23
20 YOS, 10% Member Contribution, L2050	$ 260,114.57	$ 2,121,157.54	$ 2,381,272.11
20 YOS, 10% Member Contribution, C Fund	$ 321,624.49	$ 2,121,157.54	$ 2,442,782.03

The FV's of the TSP contributions listed in column "A" of Table 6 differ based on the TSP investment decisions made by the service member. How much or how little service members' contribute into their TSP accounts as well as what funds they choose to invest in will ultimately determine the value of service member TSP investments. Conversely, Column "B" of Table 6 remains fixed because the $2,121,157.54 is simply the total PV of the defined benefit payments received during retirement. This figure also represents the total cost incurred by the government, per service member, under the current retirement system. Adding together columns "A" and "B" provides the total NPV figure that a typical O-5 retiree can expect to achieve in each scenario under the current retirement system. In Chapter IV subsection D. 1 of this report, these NPV totals are compared against the NPV outcomes that are determined under the particulars of the new retirement proposal in order to identify which retirement system represents the better value to service members.

C. NPV OF THE PROPOSED RETIREMENT SYSTEM

1. PV of Defined Benefit

As discussed in Chapter II, the Military Compensation and Retirement Modernization Commission provided their final report to the President and Congress detailing their proposals for modernizing military retirement. While the commission recommended that the military, in order to maintain proper recruitment and retention levels, should continue to provide a defined benefit (pension) plan to all eligible retirees, the commission has proposed and recommended reducing the base pay multiple from 2.5 percent of base pay to 2 percent to determine monthly annuity retirement payments for retirees . In effect, reducing the retirement base pay multiple to 2 percent means that new retirees, those who complete 20 YOS, would now receive 40 percent of their HI-3 base pay at retirement as opposed to the 50 percent of their HI-3 base pay that they receive under the current system. The commission asserts that this change will not only reduce pension costs for the government, but they also proclaim that the financial impact to service members would be offset by the adoption of government matching TSP contributions.

Aside from recommending that the base pay multiple be reduced from 2.5 percent of base pay to 2 percent, the commission has not recommended any other changes that would reduce the monthly defined benefit payment of the newly proposed retirement system from that of our current system. The proposed system continues to offer defined benefit payments to service members after the completion of 20 YOS. To ensure a valid comparison can be made against the defined benefit portion of the current retirement system, the assumptions remain unchanged from those stipulated in Chapter IV subsection B1 of this report. That is, the assumptions are that the typical active duty officer enters service at age 22, reaches retirement at age 42 after the completion of 20 YOS, and is retired for 43 years before dying at age 85. As such, we assume again that the service member will receive a total of 516 defined benefit payments in retirement. Again, to remain consistent with the assumptions applied to derive at the PV of the defined benefit for the current retirement system, a 2 percent COLA was likewise applied in deriving at the PV of the defined benefit portion of the new retirement system proposal.

Since the base pay multiple is reduced to 2 percent under the newly proposed retirement system, the defined benefit payment earned at retirement is now calculated by multiplying the new 2 percent multiple by the service member's HI-3 base pay and total number of service years completed (Military Compensation and Retirement Modernization Commission Report, 2015). To determine monthly defined benefit payments for service members at retirement under the newly proposed retirement system, we assume again that a typical officer, given typical promotion and TIG requirements, should reach the O-5 pay rate by 20 YOS with an average HI-3 base pay of $8,342.45. As such, an O-5 entering retirement at age 42 would be paid the following monthly defined benefit under the new retirement system:

$8,342.45(HI-3 Avg) x .02(HI-3 Multiplier) x 20 (YOS) = $3,336.98.

The PV formula was utilized to individually discount each one of the 516 total defined benefit payments received over the 43 year retirement period. A rate of return (r) of 2 percent was once again used as an offset to the 2 percent COLA adjustment that was incorporated. Table 7 provides a summary of the PV calculations for the defined benefit

portion of the new retirement system. The results indicate that while a total of $2,689,317.61 in defined benefit is paid to the service member over the course of the 43 year retirement period, the total PV of all monthly retirement payments discounted back to the start of retirement (age 42) is $1,696,924.00.

Figure 9. Timeline (proposed system):

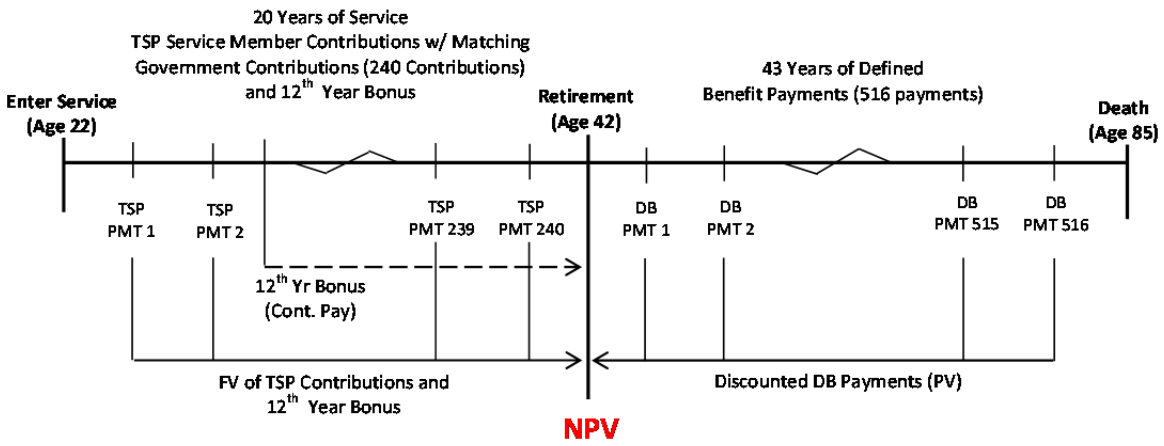

Table 7. PV of defined benefit (proposed system)

PMT Period (20 Total YOS)	PMT	PV	
1	$ 3,336.98	$ 3,331.43	
2	$ 3,336.98	$ 3,325.88	
3	$ 3,336.98	$ 3,320.35	
4	$ 3,336.98	$ 3,314.83	
5	$ 3,336.98	$ 3,309.31	
6	$ 3,336.98	$ 3,303.80	
7	$ 3,336.98	$ 3,298.31	
8	$ 3,336.98	$ 3,292.82	
9	$ 3,336.98	$ 3,287.34	
10	$ 3,336.98	$ 3,281.87	
11	$ 3,336.98	$ 3,276.41	
12	$ 3,336.98	$ 3,270.96	End Year 1
13	$ 3,403.72	$ 3,330.83	
14	$ 3,403.72	$ 3,325.28	
15	$ 3,403.72	$ 3,319.75	
16	$ 3,403.72	$ 3,314.23	
17	$ 3,403.72	$ 3,308.71	
18	$ 3,403.72	$ 3,303.21	
19	$ 3,403.72	$ 3,297.71	
20	$ 3,403.72	$ 3,292.22	
21	$ 3,403.72	$ 3,286.75	
22	$ 3,403.72	$ 3,281.28	
23	$ 3,403.72	$ 3,275.82	
24	$ 3,403.72	$ 3,270.37	End Year 2
⋮	⋮	⋮	
505	$ 7,665.86	$ 3,306.24	
506	$ 7,665.86	$ 3,300.74	
507	$ 7,665.86	$ 3,295.24	
508	$ 7,665.86	$ 3,289.76	
509	$ 7,665.86	$ 3,284.29	
510	$ 7,665.86	$ 3,278.82	
511	$ 7,665.86	$ 3,273.37	
512	$ 7,665.86	$ 3,267.92	
513	$ 7,665.86	$ 3,262.48	
514	$ 7,665.86	$ 3,257.05	
515	$ 7,665.86	$ 3,251.63	
516	$ 7,665.86	$ 3,246.22	
Totals	$ 2,689,317.61	$ 1,696,924.00	

Comparing this total defined benefit PV to the total defined benefit PV of the current retirement system indicated at the bottom of Table 4 reveals, as one would expect given the reduced base pay multiple of the proposed retirement system, that the defined benefit of the current retirement system is $424,233.54 ($2,121,157.54 – 1,696,924.00) greater than that of the proposed system at retirement (age 42). In the proceeding section, Chapter IV subsection C. 2, the effect of government matching TSP contributions are factored into the analysis and later combined with the defined benefit portion of the new retirement system proposal to arrive at a total NPV for the newly proposed retirement system.

The right-hand side of Figure 2 above graphically illustrates retirement defined benefit payments being discounted to the start of retirement at age 42. That is, the right-hand side of the outline illustrates the discounting of 516 defined benefit payments to arrive at the $1,696,924.00 PV total for the defined benefit portion of the new retirement plan proposal. Note that the right-hand side of Figure 1 and Figure 2 are identical. This is reflective of the fact that while the retirement base pay multiple is reduced under the

newly proposed retirement system, the defined benefit payment structure of both the current and proposed system remains unchanged.

2. FV of TSP Member Contributions (with Government Match)

In addition to the reduction of the retirement base pay multiple; the other significant change introduced in the new retirement plan proposal is the introduction of government matching TSP contributions. Under the proposed plan, service members would receive dollar – for –dollar matching TSP contributions (up to 5 percent of base pay) from the government. Furthermore, the new retirement proposal recommends paying service members a continuation pay bonus at the conclusion of 12 YOS. As discussed in Chapter II, the multipliers used to determine the amount of this bonus vary based on service member rank and service component. To factor this component into the analysis, the assumption is made that a service member, at 12 years of service, is an active duty O-4 Lieutenant Commander in the U.S. Navy. The O-4 paygrade is assumed here because typical officer promotion paths in the Navy will place officers in the O-4 paygrade by year 12 of service. Given the recommendation made by the Military Compensation and Retirement Modernization Commission, an active duty naval officer should receive, at the conclusion of 12 YOS, continuation pay equal to 15.2 times their monthly base pay. As such, continuation pay for this analysis is calculated as followed:

$6,990.60 (O-4 basic pay at 12 YOS) * 15.2 (Continuation Pay Multiple) = $106,257.12

The same assumptions applied in Chapter IV subsection B. 2 are applied to the analysis results described below. That is, the following assumptions were made to derive at NPV figures for the defined contribution portion of the new retirement proposal: the service member makes 240 total TSP contributions (this time with government matching contributions); TSP contribution rates were factored in at a rate of 1 percent, 3 percent, 5 percent, and 10 percent of service member base pay; service member base pay totals were taken directly from the 2015 military basic pay table and applied to the typical promotion path for officers in line with time in grade requirements; in addition to pay raises based on promotions, annual pay raises were factored into the analysis at 1 percent; and the

historical rates of return for TSP's G-Fund, L2050 Fund, and C-Fund are utilized. In addition, a new assumption is made to account for the $106,257.12 continuation pay bonus received at the conclusion of 12 YOS. The assumption applied here is that officers will invest the continuation pay bonus they receive into the same fund their TSP is invested into. That is, the $106,257.12 bonus will be invested into the G-Fund, L2050 Fund, or the C-Fund, compounding monthly at the historical averages of these funds for 8 years (96 periods) until retirement at age 42. As such, three different total FV's were found for the continuation pay bonus. The values are presented in Table 8. Refer to the left-hand side of the Figure 2 outline for an illustrative representation of the continuation pay bonus FV being brought forward 8 years to retirement eligibility at age 42.

Table 8. Total FV of continuation pay bonus (proposed system)

Investment Options	Continuation Pay Bonus	Avg. Rate of Return	n (periods)	FV of Continuation Pay
G Fund	$ 106,257.12	2%/12 = .0016667	12*8 = 96	$ 124,677.28
L2050	$ 106,257.12	6%/12 = .005	12*8 = 96	$ 171,514.16
C Fund	$ 106,257.12	8%/12 = .006667	12*8 = 96	$ 201,087.05

The future value (FV) formula was utilized to arrive at a FV for each one of the 240 total TSP government matched contributions made by the service member over the course of a 20 year career. Referring to Figure 2 again, these contributions are graphically illustrated on the left-hand side of the timeline with total FV for each TSP contribution being brought forward to the start of retirement at age 42. FV totals are calculated under the same scenarios stipulated in Chapter IV subsection B.2 in which the service member could contribute 1 percent, 3 percent, 5 percent, or 10 percent of base pay into the G-Fund, L2050 fund, or the C-Fund; albeit this time, government matching TSP contributions are incorporated into the analysis. The FV results are indicated in Table 9.

Table 9. PV Member TSP contribution (proposed system)

Member TSP Contribution W/ Government Matching (% of base pay)	20 Year Future Values: G Fund (r = 2%)	L 2050 (r = 6%)	C Fund (r = 8%)
1%	$ 35,263.94	$ 52,022.91	$ 64,324.90
3%	$ 105,791.81	$ 156,068.74	$ 192,974.69
5%	$ 176,319.69	$ 260,114.57	$ 321,624.49
10%	$ 264,479.53	$ 390,171.85	$ 482,436.73

3. Total NPV of Proposed Retirement System (Defined Benefit + Member TSP Contribution with Government Match)

To arrive at the total NPV of the new retirement system proposal, our analysis combines the outcomes of both the right and left sides of the Figure 2 NPV outline. That is, the total PV of defined benefit payments received in retirement, the total FV of service members' career-long government matched TSP contributions, and continuation pay FV were calculated and added together to arrive at NPV totals for each of the scenarios analyzed. The totals are indicative of what the total value of the retirement plan would be to the service member at the start of his or her retirement at age 42. Table 10 provides NPV totals for each of the scenarios analyzed.

Table 10. Total NPV (proposed system)

TSP Investment Scenario	(A) FV of TSP Contributions (w/ Gov't Matching)	(B) PV of Defined Benefit	(C) FV of Contination Pay Bonus	(A) + (B) + (C) TOTAL NPV
20 YOS, 1% Member Contribution, G Fund	$ 35,263.94	$ 1,696,924.00	$ 124,677.28	$ 1,856,865.22
20 YOS, 1% Member Contribution, L2050	$ 52,022.91	$ 1,696,924.00	$ 171,514.16	$ 1,920,461.07
20 YOS, 1% Member Contribution, C Fund	$ 64,324.90	$ 1,696,924.00	$ 201,087.05	$ 1,962,335.95
20 YOS, 3% Member Contribution, G Fund	$ 105,791.81	$ 1,696,924.00	$ 124,677.28	$ 1,927,393.09
20 YOS, 3% Member Contribution, L2050	$ 156,068.74	$ 1,696,924.00	$ 171,514.16	$ 2,024,506.90
20 YOS, 3% Member Contribution, C Fund	$ 192,974.69	$ 1,696,924.00	$ 201,087.05	$ 2,090,985.75
20 YOS, 5% Member Contribution, G Fund	$ 176,319.69	$ 1,696,924.00	$ 124,677.28	$ 1,997,920.97
20 YOS, 5% Member Contribution, L2050	$ 260,114.57	$ 1,696,924.00	$ 171,514.16	$ 2,128,552.72
20 YOS, 5% Member Contribution, C Fund	$ 321,624.49	$ 1,696,924.00	$ 201,087.05	$ 2,219,635.54
20 YOS, 10% Member Contribution, G Fund	$ 264,479.53	$ 1,696,924.00	$ 124,677.28	$ 2,086,080.81
20 YOS, 10% Member Contribution, L2050	$ 390,171.85	$ 1,696,924.00	$ 171,514.16	$ 2,258,610.01
20 YOS, 10% Member Contribution, C Fund	$ 482,436.73	$ 1,696,924.00	$ 201,087.05	$ 2,380,447.79

The FV's listed in column "A" of Table 10 reflect the total FV of government matched TSP contributions under the TSP investment scenarios provided. The fixed value listed in column "B" is the total PV of the defined benefit (pension) portion of the new retirement proposal. The base pay retirement multiple stipulated under the new proposal reduces the PV of the defined benefit received in retirement to $1,696, 924.00. Column "C" lists the FV's of the continuation pay bonus compounded monthly for 8 years for in the G, L2050, or C-fund. Finally, the total NPV column located at the far right of Table 10 lists the sum of the previous three columns for each investment scenario considered. These values represent the total NPV of the proposed retirement system that a typical O-5 retiree can expect to achieve under each scenario provided under the new retirement proposal.

In the proceeding section, a side by side total NPV summary comparison of the two retirement systems (current and proposed) is provided. The comparison can help determine, given the various TSP investment scenarios considered, which retirement system - current or new - is the better value to the service member. In addition, the total cost to the government for each retirement system is provided.

D. NPV COMPARISON SUMMARY AND TOTAL COST TO GOVERNMENT

1. NPV Comparison Summary: Current HI-3 versus Proposed System

This section compares the NPV of the current HI-3 retirement system to the NPV of the new retirement proposal under the various TSP investment scenarios considered. The NPV totals found in subsections B. 3 and C. 3 of this chapter represent the total NPV's for the two retirement systems. Table 11 provides a side-by-side of these NPV totals. The far right column (Delta) represents the difference in total NPV between the two retirement systems. That is, the values in this column, under the scenarios analyzed, represent the decrease in value the service member would receive under the new proposal versus the current retirement system.

Table 11. NPV comparison (current system versus new system)

TSP Investment/Contribution Scenarios	NPV Current System	NPV Proposed System	Delta (-)
20 YOS, 1% Member Contribution, G Fund	$ 2,138,789.51	$ 1,856,865.22	$ (281,924.29)
20 YOS, 1% Member Contribution, L2050	$ 2,147,169.00	$ 1,920,461.07	$ (226,707.93)
20 YOS, 1% Member Contribution, C Fund	$ 2,153,319.99	$ 1,962,335.95	$ (190,984.04)
20 YOS, 3% Member Contribution, G Fund	$ 2,174,053.45	$ 1,927,393.09	$ (246,660.36)
20 YOS, 3% Member Contribution, L2050	$ 2,199,191.91	$ 2,024,506.90	$ (174,685.02)
20 YOS, 3% Member Contribution, C Fund	$ 2,217,644.89	$ 2,090,985.75	$ (126,659.14)
			$ -
20 YOS, 5% Member Contribution, G Fund	$ 2,209,317.39	$ 1,997,920.97	$ (211,396.42)
20 YOS, 5% Member Contribution, L2050	$ 2,251,214.83	$ 2,128,552.72	$ (122,662.10)
20 YOS, 5% Member Contribution, C Fund	$ 2,281,969.79	$ 2,219,635.54	$ (62,334.24)
20 YOS, 10% Member Contribution, G Fund	$ 2,297,477.23	$ 2,086,080.81	$ (211,396.42)
20 YOS, 10% Member Contribution, L2050	$ 2,381,272.11	$ 2,258,610.01	$ (122,662.10)
20 YOS, 10% Member Contribution, C Fund	$ 2,442,782.03	$ 2,380,447.79	$ (62,334.24)

In all scenarios considered for a typical O-5 retiree, the current HI-3 retirement system yields a higher NPV total than that of the new retirement proposal. Whether an officer, throughout his or her career, chooses to invest into the G-fund, L2050 fund, or C-fund with a contribution rate of 1 percent, 3 percent, 5 percent, or 10 percent, the total NPV of the current retirement system is still higher across the board, despite the 12th year bonus and matching TSP contributions offered in the new retirement proposal. The higher NPV totals of the current HI-3 system are indicative of the fact that the higher retirement base pay multiple received under the current system earns the typical O-5 retiree roughly $424,233 more than what he or she would receive in defined benefit payments under the new proposal during retirement. The results indicate that even career-long monthly TSP contributions of 15 percent (10 percent member contribution with 5 percent government matching contribution) invested in the G-fund, L2050, or C-fund combined with the FV of the 12th year continuation pay bonus, cannot offset the additional NPV earned under the current retirement system. For example, Table 11 indicates that the differences in NPV between the current HI-3 retirement system and the proposed system, under the scenarios indicated, are $211,396.42, $122,662.10, and $62,334.24, respectively, for the given scenarios in which a typical officer contributes 5

percent, or 10 percent of base pay into the G-fund, L2050, or C-fund. Only after the service member invests his or her continuation pay bonus into the C-fund while also making career-long C-fund TSP contributions of at least 5 percent, earning the full government match, does the NPV of the proposed system approach that of the current system. The delta in this scenario is just $62,334.24 in favor of the current system. While the two retirement systems under this scenario do seem comparable, they are only comparable if TSP funds maintain their historical average rates of return. With this in mind, it is important for the service member to recognize that the most significant disadvantage of the new retirement plan is the greater emphasis it places on its defined contribution (TSP) component. The fixed defined benefit component is reduced in favor of the continuation pay bonus and matching TSP contributions. However, the total value of the continuation pay bonus and matching TSP contributions of the new retirement system are not fixed in nature. Instead, the total value of these components may vary greatly depending on actual returns earned on chosen TSP funds.

2. Government Cost Comparison: Current HI-3 versus. Proposed System

As discussed above, the new retirement proposal places more risk on the backs of service members' because of the greater vulnerability its TSP component will experience with adverse or less advantageous market fluctuations. Not only does the new proposal push more risk to the service member, but it does so while reducing overall retirement costs for the government. Table 12 summarizes total costs to the government for each retirement system.

Table 12. Total retirement system costs
(current system versus proposed system)

TSP Contribution Scenarios	Current System Total Cost	Proposed System Total Costs	Total Cost Savings to Government
1% Member Contribution	$ 2,121,157.54	$ 1,817,960.13	$ 303,197.41
3% Member Contribution	$ 2,121,157.54	$ 1,847,518.15	$ 273,639.39
5% Member Contribution	$ 2,121,157.54	$ 1,877,076.17	$ 244,081.38
10% Member Contribution	$ 2,121,157.54	$ 1,877,076.17	$ 244,081.38

Total cost for the current HI-3 system remains fixed under all scenarios considered because, with no government matching TSP contributions to consider, the only cost to government is represented by the total NPV of the Defined benefit payments received in retirement. On the other hand, calculating total costs for the new retirement proposal is accomplished by combining the total NPV of the defined benefit portion of the plan, the lump sum value of the continuation pay bonus received at the conclusion of 12 YOS, and the cumulative total of all 240 matching TSP contributions made by the government on behalf of the officer throughout the course of his or her career.

The far right column of Table 12 represents the total cost savings under the various TSP contribution scenarios that the government would achieve by replacing the current HI-3 system with the new retirement proposal. Despite matching TSP government contributions (up to 5 percent of base pay) and the continuation pay bonus paid, the cost to the government per service member is significantly reduced under the proposed system. Table 12 indicates that the government will save $244,081.38 on each O-5 retiree, assuming that the service member earned at least a 5 percent government match on his or her monthly TSP contribution throughout the entirety of their career. The savings is even greater to the government if the O-5 contributes less than 5 percent of base pay into TSP, thereby forgoing the full 5 percent government match. Likewise, the savings to the government would be even greater if this analysis was conducted from the standpoint of a typical NCO retiree. That is, the costs associated with paying the continuation bonus at the conclusion of 12 YOS as well as the costs incurred by the government with respect to matching TSP contributions are far less for enlisted personnel than they are for officers.

In Chapter V of this project, the analysis of the results found in this chapter is drawn upon to present conclusions about the new retirement proposal. In addition, investment scenarios are recommended to help service members maximize the total NPV value of this new system, should it be adopted into law.

V. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

The results of the analysis discussed in Chapter IV demonstrate that the NPV of the current HI-3 retirement system, in all scenarios analyzed for an O-5 retiree, is higher than the NPV of the newly proposed retirement system. That is, the monetary value of the current HI-3 system at retirement (age 42) is more than that of the proposed system. As such, the current system remains the better *and* less risky value for all retirement scenarios modeled by our project.

Our research findings somewhat diverge with the findings of the Military Compensation and Retirement Modernization Committee that the overall retirement value to the service member is greater under the new proposal. We believe the primary reason for the difference in research results is driven by the decision of the Modernization Committee to exclude service member TSP contributions from their NPV calculations of the current retirement system (Military Compensation and Retirement Modernization Commission, 2015). Our project assumes service member TSP contributions in the current retirement system at same the percentage of base pay that is applied to the proposed retirement system, minus the government match. This results in a more equitable comparison. Additionally, the Commission's Final Report assumes slightly different discount rates in some circumstances. We believe our discount rates are realistic and have defended our reasoning.

Another explanation for our divergent conclusion is the fact that the Modernization Commission achieves increased retirement assets for the average service member by attempting to reduce inefficiencies in the current retirement system as a whole, through such measures as automatic TSP enrollment and increased financial awareness training (Military Compensation and Retirement Modernization Commission, 2015). Our project analyses only the optimal retirement decision for an individual service member and makes no assumption regarding the likeliness of service member TSP participation under either retirement system. It is unnecessary to do so when comparing

NPV of retirement options for an individual officer. The conclusion reached is each individual should be free to make investing decisions that fit their risk tolerance and maximize financial value. In our model the best decision would be to choose the current retirement system.

The reduction in defined benefit and the increased emphasis placed on the defined contribution portion of the new proposal shifts risk away from the government and onto service members. As such, the decisions service members make with respect to TSP will have a greater impact on the total value of their retirement. Because the new proposal places a greater emphasis on the defined contribution component, total value will vary based more so on the decisions made with respect to how *much* money is invested and *how* money is invested. These decisions have less effect on service members under the current system.

B. RECOMMENDATIONS FOR FURTHER RESEARCH

Our project has definitively shown that an individual O-5 in the Navy who retires after 20 years of service should prefer the current retirement system to the proposed blended system. However, there are many questions as yet unanswered that are beyond the scope of our project. Further research into the proposed changes would be beneficial to more thoroughly examine the potential savings to the government and the benefits to a wider-range of service members.

A selling point of the new system is reduced government expenditures (Military Compensation and Retirement Modernization Commission, 2015). Not unlike U.S. corporations who have shifted away from defined benefit pension plans to 401k styled defined contribution plans, the United States Government is open to altering the present retirement system to ultimately cut costs associated with military retirement. As the Chapter IV analysis indicates, the government would in fact cut costs by switching to the blended retirement proposal.

Additional variables could be added to our model. Many service members leave the military before serving 20 years. As such, they receive no benefits in retirement beyond their non-matched TSP contributions. Research into how much money the

government would spend on TSP matching for these service members could be incorporated into total government costs in the proposed retirement system. Research into potential government savings versus. NPV of retirement assets for service members retiring at lower or higher ranks and with less than or greater than 20 years of service is necessary.

The effect on the NPV delta between the two retirement systems could be further amplified if the same analysis incorporated junior enlisted and Non-Commissioned Officer (NCO) TSP contribution amounts. Chapter IV analysis indicated that, under the newly proposed retirement system, a typical O-5 who makes career-long contributions of 10 percent of his or her basic pay into the TSP's C-fund, receives the full 5 percent government matching contribution and receives a continuation pay bonus equal to 15.2 times their O-4 basic monthly pay at the conclusion of 12 YOS, still does not match the NPV of the current retirement system. Military officers earn significantly more throughout the duration of their careers than do junior enlisted personnel and NCOs. Therefore, officers have the ability to contribute higher monthly sums into their TSP accounts. That is, the monetary value of a typical officer's monthly 10 percent contribution into TSP is far greater than a 10 percent TSP contribution from a junior enlisted member or NCO. Likewise, the continuation pay bonus earned at the conclusion of 12 YOS for a typical officer is far greater than the continuation pay bonus earned by enlisted personnel and NCOs. Under the new retirement proposal, all Navy enlisted service members earn continuation pay equal to 4.8 times their monthly basic pay at the conclusion of 12 YOS, while all Navy officers earn 15.2 times their monthly basic pay at the conclusion of 12 YOS (Military Compensation and Retirement Modernization Commission, 2015). The disparity is significant because the typical O-4 would receive roughly $106,257, while a typical E-6 enlisted service member would only receive roughly $17,115. Not only is the difference in face value significant, but when you also consider any compounded return on this money over a long period of time, the difference is further magnified.

The typical enlisted service member, as introduced above, may have to make much larger monthly TSP contributions, far exceeding 10 percent of basic pay, under the

proposed retirement system in order to attain the NPV achieved under the current system. Given the lower income levels earned by enlisted service members, contributing more than 10 percent of basic pay into TSP could prove extremely difficult. Comprehensive research into the financial impacts of the proposed system on all enlisted ranks is warranted.

VI. SUPPLEMENTAL: NET PRESENT VALUE EXCEL DATA

The supplemental Microsoft Excel spreadsheet that accompanies this MBA project provides all of the net present value (NPV) calculations that were utilized to arrive at, analyze, and support the findings and conclusions herein The Excel model separates the various NPV calculations into multiple tabs. To arrive at the total NPV for each respective retirement system (current versus proposed), the defined benefit and defined contribution portion of each retirement system is determined separately under its own respective tab within the Excel spreadsheet. The combined (total) NPV is provided separately in the final tab of the spreadsheet. All NPV figures were derived by applying the career trajectory for the typical military officer that ultimately retires from active duty at the O-5 paygrade after the completion of 20 years of military service.

The NPV for the defined benefit component of each retirement system was found by discounting 516 total payments that the officer would receive in retirement, while the NPV for the defined contribution component of each retirement system was found by finding the future value of 240 total TSP contributions, whether they were made solely by the service member under the current system, or by both the service member and the government under the newly proposed system. Additionally, the NPV of the defined contribution portion of the newly proposed retirement system factors a continuation pay bonus at year 12 of the service member's career. Finally, to arrive at NPV for the defined contribution components of each retirement system, various member TSP contribution rates were applied, as a percentage of base pay, into various TSP funds (G-Fund, L2050-Fund, C-Fund) and their respective historical rates of return were applied.

The total cost to the government for each retirement system then is provided in the final tab of the supplemental Excel spreadsheet. All rates and applied assumptions are listed in each respective tab of the NPV Excel spreadsheet. For access to the Supplemental NPV Excel spreadsheet that accompanies this MBA project, please contact the Naval Postgraduate School Dudley Knox Library.

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